

Claims

1. A protein complex comprising at least two, preferably identical, subunits wherein at least one subunit is unaltered and at least one subunit is fused to a
5 first molecule of interest and wherein the protein complex is able to interact with a cell surface receptor via said subunits.
2. A protein complex according to claim 1, wherein said first molecule of interest can associate with, preferably via a covalent bond, a second molecule of
10 interest to form a multimer of interest.
3. A protein complex according to claim 1 or 2, wherein said complex is essentially based on the heat labile enterotoxin (LT) of *E. coli* or on the cholera toxin (CT) of *Vibrio cholerae*, preferably the B subunits thereof.
15
4. A protein complex according to any of the preceding claims, wherein said complex comprises at least two subunits provided with a molecule of interest.
5. A protein complex according to claim 4, wherein said at least two subunits
20 are provided with a different molecule of interest.
6. A protein complex according to any one of the preceding claims, wherein said cell surface receptor is present on intestinal epithelial.
- 25 7. A protein complex according to any one of the preceding claims, wherein at least one molecule of interest is an antigen.
8. A protein complex according to claim 7, wherein said antigen is selected from the group consisting of a bacterial antigen, a viral antigen, a protozoal
30 antigen and a fungal antigen.
9. A protein complex according to any one of claims 1 to 6, wherein at least one molecule of interest is an immunomodulatory protein, preferably a cytokine or a heat-shock protein.
35

10. A protein complex according to any one of the preceding claims, wherein said complex comprises five B subunits of the heat labile enterotoxin (LT) of *E. coli* or the cholera toxin (CT) of *Vibrio cholerae*, wherein at one subunit is unaltered.

5

11. A protein complex according to any one of the preceding claims, wherein said cell surface receptor comprises a ganglioside molecule, preferably GM1, or a mimic thereof.

10

12. A method for producing a protein complex according to any one of claims 1-11, comprising:

a) providing a host cell with a nucleotide sequence encoding an unaltered subunit and a nucleotide sequence encoding a molecule of interest, wherein at least one molecule of interest is fused to a subunit;

15

b) culturing said host cell thereby allowing expression of said nucleotide sequences and allowing for assembly of the protein complex;

c) isolating the complex;

d) determining the binding of the complex to a cell surface receptor or to a molecule which mimics a cell surface receptor.

20

13. A method for producing a protein complex according to any one of claims 1-11, comprising:

a) providing a first host cell with a nucleotide sequence encoding an unaltered subunit and a second host cell a nucleotide sequence encoding a molecule of interest, wherein at least one molecule of interest is fused to a subunit;

25

b) culturing said host cells thereby allowing expression of said nucleotide sequences;

c) isolating the proteins encoded by said nucleotides;

d) contacting the isolated protein under conditions allowing for assembly of the protein complex;

30

e) isolating the complex;

f) determining the binding of the complex to a cell surface receptor or to a molecule which mimics a cell surface receptor.

14. A method according to claim 13, wherein said host cell is provided with said nucleotide sequences using transformation, co-transformation, crossing, re-transformation or transient transfection.
- 5 15. A cell comprising the protein complex according to any one of claims 1 to 11.
16. A cell according to claim 15, wherein said cell is a plant cell.
- 10 17. A cell according to claim 15 or 16, wherein said cell is an edible cell.
18. A composition comprising a protein complex according to any one of claims 1-11 or a cell according to any one of claims 15-17.
- 15 19. A vaccine comprising a protein complex according to any one of claims 1-10 or a cell according to any one of claims 15-17 and a pharmaceutically acceptable carrier.
- 20 20. A pharmaceutical composition comprising an effective amount of a vaccine according to claim 19.
21. Use of a protein complex according to any one of claims 1-11 as a mucosal carrier molecule.
- 25 22. A method for modulating an immune response of a subject comprising administering to the subject at least one dose of an effective amount of a protein complex according to any one of claims 1-11, wherein the molecule of interest is an antigen.
- 30 23. A method for mucosal immunisation comprising the administration of a vaccine according to claim 19 to a subject.